

AMENDMENTS TO THE CLAIMS

The listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A dental composition for bonding an amalgam restorative to a dental substrate, comprising:

at least one polymerizable material;

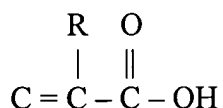
at least one photoinitiator in an amount so that a portion of the dental composition at least partially polymerizes and adheres to a dental substrate when the dental composition is exposed to radiant energy and at least a portion of an exposed surface of the polymerizable material remains at least partially unpolymerized and deformable when the dental composition is exposed to a quantity of radiant energy sufficient to initiate polymerization of the polymerizable material during use; and

at least one chemical initiator that does not cause the polymerizable material to polymerize when initially mixed therewith but that causes further polymerization of the polymerizable material when the dental composition is ~~in contact~~ contacted with an amalgam restorative during use.

2. (Original) A dental composition as defined in claim 1, wherein the polymerizable material comprises at least one polymerizable promoter.

3. (Original) A dental composition as defined in claim 2, wherein the polymerizable promoter comprises at least one of a monomer, oligomer or other prepolymer having at least one ethylenically unsaturated group and at least one carboxylic acid group.

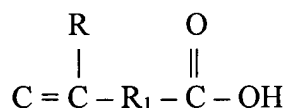
4. (Original) A dental composition as defined in claim 2, wherein the polymerizable promotor comprises, or is an oligomer of, at least one monomer having the formula:



wherein R is a hydrogen radical, a methyl group, a saturated aliphatic radical, an unsaturated aliphatic radical, a halogen radical or a CN radical.

5. (Original) A dental composition as defined in claim 2, wherein the polymerizable promotor comprises at least one of methacrylic acid or acrylic acid.

6. (Original) A dental composition as defined in claim 2, wherein the polymerizable promotor comprises, or is an oligomer of, at least one monomer having the formula:



wherein R is a hydrogen radical, a methyl group, a saturated aliphatic radical, an unsaturated aliphatic radical, a halogen radical or a CN radical; and wherein R₁ is at least one oxygen radical, a saturated aliphatic radical, a saturated aliphatic radical interrupted by at least one oxygen or other polar radical, an unsaturated aliphatic radical, an unsaturated aliphatic radical interrupted by at least one oxygen or other polar radical, a homocyclic radical, a heterocyclic radical, a polymerizable moiety, or an aryl radical having four to six carbon atoms and a valency of n+1, with n being an integer of at least 6.

7. (Original) A dental composition as defined in claim 6, wherein the polymerizable promotor comprises at least one of 4-pentenoic acid, 6-heptenoic acid, or 2,2-dimethyl-4-pentenoic acid.

8. (Original) A dental composition as defined in claim 2, wherein the polymerizable promotor has a concentration in a range of about 0.5% to about 60% by weight of the dental composition.

9. (Original) A dental composition as defined in claim 2, wherein the polymerizable promotor has a concentration in a range of about 0.75% to about 50% by weight of the dental composition.

10. (Original) A dental composition as defined in claim 2, wherein the polymerizable promotor has a concentration in a range of about 1% to about 40% by weight of the dental composition.

11. (Original) A dental composition as defined in claim 1, wherein the polymerizable material comprises at least one polymerizable resin.

12. (Original) A dental composition as defined in claim 11, wherein the polymerizable resin comprises at least one of a hydrophilic resin having at least one hydroxy group or a hydrophobic resin.

13. (Original) A dental composition as defined in claim 11, wherein the polymerizable resin comprises at least one of hydroxyalkyl methacrylate, hydroxyalkyl acrylate, alkyl methacrylate or alkyl acrylate.

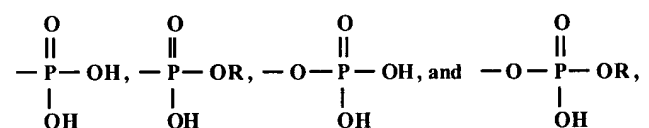
14. (Original) A dental composition as defined in claim 11, wherein the polymerizable resin comprises at least one of HEMA, Bis-GMA, glycerol dimethacrylate, methyl acrylate, methyl methacrylate, or triethylene glycol dimethacrylate.

15. (Original) A dental composition as defined in claim 14, wherein the Bis-GMA has a concentration of less than about 4% by weight of the dental composition.

16. (Original) A dental composition as defined in claim 14, wherein the Bis-GMA has a concentration of less than about 3% by weight of the dental composition.

17. (Original) A dental composition as defined in claim 14, wherein the Bis-GMA has a concentration of less than about 2% by weight of the dental composition.

18. (Original) A dental composition as defined in claim 11, wherein the polymerizable resin comprises at least one of the following groups:



wherein R is an alkyl.

19. (Original) A dental composition as defined in claim 11, wherein the polymerizable resin comprises at least one of bis glycerol methacrylate phosphate, bis 2-hydroxy ethyl methacrylate phosphate, phosphate ester of p-hydroxyphenyl methacrylamide, phosphate ester of 3-hydroxy propyl methacrylate, or phosphate ester of 4-hydroxy butyl methacrylate.

20. (Original) A dental composition as defined in claim 11, wherein the polymerizable resin has a concentration in a range of about 0.5% to about 60% by weight of the dental composition.

21. (Original) A dental composition as defined in claim 11, wherein the polymerizable resin has a concentration in a range of about 0.75% to about 50% by weight of the dental composition.

22. (Original) A dental composition as defined in claim 11, wherein the polymerizable resin has a concentration in a range of about 1% to about 40% by weight of the dental composition.

23. (Original) A dental composition as defined in claim 1, wherein the photoinitiator comprises at least one α -diketone.

24. (Original) A dental composition as defined in claim 1, wherein the photoinitiator comprises at least one of camphoroquinone, benzoin methyl ether, benzophenone or 9,10-anthraquinone.

25. (Original) A dental composition as defined in claim 1, wherein the photoinitiator comprises at least one of phenyl bis(2,4,6-trimethyl benzoyl) phosphine oxide or 2-hydroxy-2-methyl-1-phenyl-1-propanone.

26. (Original) A dental composition as defined in claim 1, wherein the photoinitiator has a concentration less than an amount that is stoichiometrically required to cause complete polymerization of the polymerizable material if irradiated with an excess of radiant energy.

27. (Original) A dental composition as defined in claim 1, wherein the photoinitiator has a concentration in a range of about 0.001% to about 0.5% by weight of the dental composition.

28. (Original) A dental composition as defined in claim 1, wherein the photoinitiator has a concentration in a range of about 0.005% to about 0.2% by weight of the dental composition.

29. (Original) A dental composition as defined in claim 1, wherein the photoinitiator has a concentration in a range of about 0.008% to about 0.08% by weight of the dental composition.

30. (Original) A dental composition as defined in claim 1, wherein the chemical initiator comprises at least one peroxide.

31. (Original) A dental composition as defined in claim 30, wherein the chemical initiator comprises benzoyl peroxide.

32. (Original) A dental composition as defined in claim 30, wherein the chemical initiator comprises at least one of 2-butanone peroxide, lauroyl peroxide or tert-butyl peroxide.

33. (Original) A dental composition as defined in claim 1, wherein the chemical initiator has a concentration in a range of about 0.001% to about 5% by weight of the dental composition.

34. (Original) A dental composition as defined in claim 1, wherein the chemical initiator has a concentration in a range of about 0.01% to about 3% by weight of the dental composition.

35. (Original) A dental composition as defined in claim 1, wherein the chemical initiator has a concentration in a range from about 0.1% to about 2% of the dental composition.

36. (Original) A dental composition as defined in claim 1, further including at least one natural resin.

37. (Original) A dental composition as defined in claim 36, wherein the natural resin comprises at least one of a rosin, distillate, sap, oil, balsam, gum, an isolated constituent of one of the foregoing, a modification of one of the foregoing, or a synthetic replication of one of the foregoing.

38. (Original) A dental composition as defined in claim 36, wherein the natural resin comprises at least one of Canadian balsam, sandarac, mastic, pontianak, copal, manilla, peruvian, benzoin, elemi, opopanax, olibanum, styrax, benzoin siam, tolu, resinoid, tall, pine, or eugenol.

39. (Original) A dental composition as defined in claim 1, further including at least one particulate filler.

40. (Original) A dental composition as defined in claim 39, wherein the particulate filler comprises at least one glass.

41. (Original) A dental composition as defined in claim 40, wherein the glass comprises barium oxide glass.

42. (Original) A dental composition as defined in claim 41, wherein at least a portion of the barium oxide glass has been silanated.

43. (Original) A dental composition as defined in claim 39, wherein the particulate filler comprises at least one fluoride-releasing compound.

44. (Original) A dental composition as defined in claim 43, wherein the fluoride-releasing compound comprises at least one calcium fluorosilicate.

45. (Original) A dental composition as defined in claim 1, further including at least one solvent.

46. (Original) A dental composition as defined in claim 45, wherein the solvent comprises at least one of a hydrophilic hydrocarbon, hydrophobic hydrocarbon, or water

47. (Original) A dental composition as defined in claim 45, wherein the solvent comprises at least one of ethanol or acetone.

48. (Original) A dental composition as defined in claim 1, further including at least one polymerization inhibitor.

49. (Original) A dental composition as defined in claim 1, wherein the dental composition, when used to bond an amalgam restorative to a dental substrate, yields a final bond strength between the amalgam restorative and dental substrate of at least about 15 MPa.

50. (Original) A dental composition as defined in claim 1, wherein the dental composition, when used to bond an amalgam restorative to a dental substrate, yields a final bond strength between the amalgam restorative and dental substrate of at least about 20 MPa.

51. (Original) A dental composition as defined in claim 1, wherein the dental composition, when used to bond an amalgam restorative to a dental substrate, yields a final bond strength between the amalgam restorative and dental substrate of at least about 25 MPa.

52. (Original) A dental composition as defined in claim 1, wherein the dental composition is a stable, one-part composition.

53. (Original) A dental composition as defined in claim 1, wherein the dental composition initially comprises multiple parts that are mixed together shortly before application to a dental substrate.

54. (Original) A dental composition as defined in claim 1, wherein the chemical initiator is initially stable when mixed with the photoinitiator and polymerizable material but decomposes when exposed to one or more metals contained in an amalgam restorative.

55. (Original) A dental composition for bonding an amalgam restorative to a dental substrate, comprising:

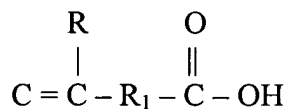
at least one polymerizable material;

at least one photoinitiator in an amount that is less than what is stoichiometrically required to cause complete polymerization of the polymerizable material if irradiated with an excess of radiant energy in the absence of oxygen; and

at least one chemical initiator that is initially stable when mixed with the photoinitiator and polymerizable material but that decomposes when exposed to one or more metals contained in an amalgam restorative in order to cause further polymerization of the polymerizable material when the dental composition comes into contact with the amalgam restorative.

56. (Original) A dental composition as defined in claim 55, wherein the polymerizable material comprises at least one polymerizable promotor that comprises at least one of a monomer, oligomer or other prepolymer having at least one ethylenically unsaturated group and at least one carboxylic acid group.

57. (Original) A dental composition as defined in claim 56, wherein the polymerizable promotor comprises, or is an oligomer of, at least one monomer having the formula:



wherein R is a hydrogen radical, a methyl group, a saturated aliphatic radical, an unsaturated aliphatic radical, a halogen radical or a CN radical; and wherein R₁ is a chemical bond, at least one an oxygen radical, a saturated aliphatic radical, a saturated aliphatic radical interrupted by at least one oxygen or other polar radical, an unsaturated aliphatic radical, an unsaturated aliphatic radical interrupted by at least one oxygen or other polar radical, a homocyclic radical, a heterocyclic radical, a polymerizable moiety, or an aryl radical having four to six carbon atoms and a valency of n+1, with n being an integer of at least 6.

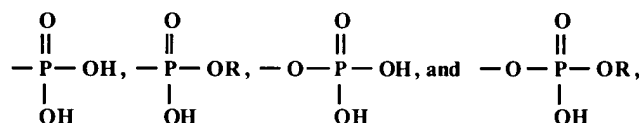
58. (Original) A dental composition as defined in claim 56, wherein the polymerizable promotor comprises at least one of methacrylic acid, acrylic acid, 4-pentenoic acid, 6-heptenoic acid, or 2,2-dimethyl-4-pentenoic acid.

59. (Original) A dental composition as defined in claim 55, wherein the polymerizable material comprises at least one polymerizable resin that comprises at least one of a hydrophilic resin having at least one hydroxy group or a hydrophobic resin.

60. (Original) A dental composition as defined in claim 59, wherein the polymerizable resin comprises at least one of hydroxyalkyl methacrylate, hydroxyalkyl acrylate, alkyl methacrylate, alkyl acrylate, HEMA, Bis-GMA, glycerol dimethacrylate, methyl acrylate, methyl methacrylate, or triethylene glycol dimethacrylate.

61. (Original) A dental composition as defined in claim 60, wherein the Bis-GMA has a concentration of less than about 4% by weight of the dental composition.

62. (Original) A dental composition as defined in claim 59, wherein the polymerizable resin comprises at least one of the following groups:



wherein R is an alkyl.

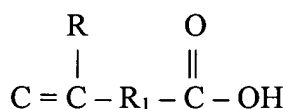
63. (Currently Amended) A dental composition for bonding an amalgam restorative to a dental substrate, comprising:

a polymerizable portion that includes at least one polymerizable promotor and at least one polymerizable resin;

at least one photoinitiator in an amount so that a portion of the dental composition at least partially polymerizes and adheres to a dental substrate when the dental composition is exposed to radiant energy and at least part of an exposed surface of the polymerizable portion remains at least partially unpolymerized and deformable when the dental composition is exposed to a quantity of radiant energy sufficient to initiate polymerization of the polymerizable portion during use; and

at least one chemical initiator that does not cause the polymerizable material to polymerize when initially mixed therewith but that causes further polymerization of the polymerizable portion when the dental composition is ~~in~~ contact contacted with an amalgam restorative during use.

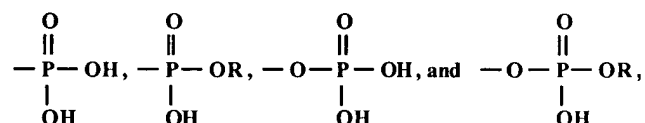
64. (Original) A dental composition as defined in claim 63, wherein the polymerizable material comprises at least one polymerizable promotor that comprises, or is an oligomer of, at least one monomer having the formula:



wherein R is a hydrogen radical, a methyl group, a saturated aliphatic radical, an unsaturated aliphatic radical, a halogen radical or a CN radical; and wherein R₁ is a chemical bond, at least one an oxygen radical, a saturated aliphatic radical, a saturated aliphatic radical interrupted by at least one oxygen or other polar radical, an unsaturated aliphatic radical, an unsaturated aliphatic radical interrupted by at least one oxygen or other polar radical, a homocyclic radical, a heterocyclic radical, a polymerizable moiety, or an aryl radical having four to six carbon atoms and a valency of n+1, with n being an integer of at least 6.

65. (Original) A dental composition as defined in claim 63, wherein the polymerizable material comprises at least one polymerizable resin that comprises at least one of a hydrophilic resin having at least one hydroxy group or a hydrophobic resin.

66. (Original) A dental composition as defined in claim 65, wherein the polymerizable resin comprises at least one of the following groups:



wherein R is an alkyl.

67. (Currently Amended) A dental composition for bonding an amalgam restorative to a dental substrate, comprising:

at least ~~one~~ two polymerizable materials, ~~with the proviso that the polymerizable material optionally includes one of which is Bis-GMA in a range from about 0% concentration of up to about 4% by weight of the dental composition;~~

at least one photoinitiator in an amount that is less than what is stoichiometrically required to cause complete polymerization of the polymerizable material if irradiated with an excess of radiant energy in the absence of oxygen; and

at least one chemical initiator that is initially stable when mixed with the photoinitiator and polymerizable material but that decomposes when exposed to one or more metals contained in an amalgam restorative in order to causes further polymerization of the polymerizable material when the dental composition comes into contact is contacted with the an amalgam restorative during use.

68. (Original) A dental composition as defined in claim 67, wherein the Bis-GMA has a concentration of less than about 3% by weight of the dental composition.

69. (Original) A dental composition as defined in claim 67, wherein the Bis-GMA has a concentration of less than about 2% by weight of the dental composition.

70. (New) A dental composition for bonding an amalgam restorative to a dental substrate, comprising:

at least one polymerizable material;

at least one photoinitiator in an amount so that at least a portion of the polymerizable material remains at least partially unpolymerized when the dental composition is exposed to a quantity of radiant energy sufficient to initiate polymerization of the polymerizable material during use;

at least one chemical initiator that causes further polymerization of the polymerizable material when the dental composition is contacted with an amalgam restorative during use; and

barium oxide glass.

71. (New) A dental composition for bonding an amalgam restorative to a dental substrate, comprising:

at least one polymerizable material;

at least one photoinitiator in an amount so that at least a portion of the polymerizable material remains at least partially unpolymerized when the dental composition is exposed to a quantity of radiant energy sufficient to initiate polymerization of the polymerizable material during use;

at least one chemical initiator that causes further polymerization of the polymerizable material when the dental composition is contacted with an amalgam restorative during use; and

calcium fluorosilicate.